

1941/45

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GENERAL HEADQUARTERS
UNITED STATES ARMY FORCES, PACIFIC
OFFICE OF THE CHIEF SURGEONAPO 500
12 November 1945

CIRCULAR LETTER)

NO 49)

LOUSE-BORNE TYPHUSARMY
MEDICAL
APR 30 1946
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I. CLINICAL:

1. General.

a. From time immemorial, louse-borne typhus fever has been one of the greatest scourges of armed forces. Stories have been handed down from the days of the Roman Empire relating to the ravages of typhus fever affecting an entire army. In World War I, Austria was reluctant to invade Serbia due to that country's highly epidemic typhus fever rate. Today, in World War II, the ever-present menace of louse-borne typhus fever is to be reckoned with wherever the exigencies of military service and tactical situations prevent the efficient cleansing of the person and clothing. Active preventive measures must be instituted. The mass inoculation procedure performed in Naples in this war is a striking example of the Army's intention to carry out such measures.

b. Serious outbreaks of epidemic louse-borne typhus have occurred recently in Hokkaido, in Northern Honshu, and Korea. Both the body louse and head louse are found widely. This situation will require immediate control action. Furthermore, the movement homeward of millions of displaced Asiatic peoples and the repatriation of Japanese military will create conditions which will favor the spread of typhus fever to areas to be occupied by the U.S. Army Forces. The probability of this group spreading typhus to previously free areas is likely. A typhus commission from Manila has already been ordered forward to Japan. Steps are being taken to control the unrestricted migration of the peoples or at least have them deloused or immunized or both before they leave Hokkaido. The immediate reestablishment of effective aerial and marine quarantine service by the Japanese government is mandatory because of the problem anticipated as a result of the Japanese repatriates returning from Pacific, Asiatic mainland, and other areas. In view of the gross inadequacy of indigenous port delousing facilities, quarantine plans contemplate the use of DDT for the delousing of all repatriates.

2. Epidemiology. Epidemic, or louse-borne, typhus occurs chiefly in temperate climates in the months between October and May. Close crowding of the population and the wearing of heavy clothing predisposes to universal lousiness and accelerates the distribution of infected lice from man to man when hygienic standards of cleanliness are lowered. All ages are attacked but the

disease is most fatal in the upper decades of life. The disease is transmitted from man to man by the louse. The feces and vomitus of infected lice contains Rickettsia prowazeki, the causative agent of epidemic typhus. Transmission is accomplished by rubbing, into the "bite", infected excrement or vomitus which the louse deposits during feeding. Although the head louse may play a role in the transmission of the disease, the body louse, Pediculus humanus var. corporis is believed to be the important vector. This louse normally inhabits the under surface of the garments worn next to the skin and feeds several times daily; it is rarely found attached on the skin. Three or four days after reaching maturity, the female begins to deposit from 3 to 5 eggs daily and continues for an average life of from 3 to 4 weeks. The eggs, when on clothing next to the body, hatch in 7-10 days and young lice reach maturity in about 2 weeks. The louse becomes infective 8-10 days after feeding on a typhus infected human and remains so for the duration of its life. The infection is not transmitted through the egg to the progeny of the louse; a louse becomes infected only by feeding on blood of an infected person. Deprivation of food causes death of the adult louse in about 9 days and the newly hatched louse in 2 days. Direct transmission of typhus from man to man by droplet infection after coughing or the breathing in of dust of infected louse feces is possible under laboratory conditions but its role in epidemics is not confirmed.

3. Clinical Picture.

a. General. Epidemic typhus fever is an acute febrile disease, clinically characterized by high fever, headache, hemorrhagic eruption over the trunk and extremities, gangrene secondary to thrombosis, apathy, and later delirium. Agglutinins are present in the patient's serum for the OX19 strain of the proteus bacillus.

b. Clinical course. Following an incubation period of from 8 to 12 days the onset of the disease is fairly sudden with chilly sensations, headache, and general malaise. Fever, which is low during the first day or so, rapidly and steadily rises and is accompanied by a headache which becomes excruciating. There is a marked apathy. About the fourth or fifth day, a rose-colored eruption appears, first on the trunk, later spreading to the extremities. This eruption, which first blanches on pressure, quickly become hemorrhagic in severe cases. The bulbar conjunctivae are injected and by the end of the first week or beginning of the second week, apathy changes to delirium. The patient may become stuporous. The blood pressure falls to low levels and gangrene of the extremities due to thrombosis, especially the toes, may occur. Fever during the second week remains elevated to high levels and the patient is desperately ill. With recovery in the third week, the fever drops by lysis and signs of mental confusion, delirium and stupor clear rapidly.

c. Disease in Vaccinated Persons. The disease in vaccinated persons is greatly modified. The fever ordinarily lasts from 4 to 6 days, the exanthem often fails to appear, and the case fatality rate is almost non-existent.

4. Differential Diagnosis. Differential diagnosis, except in epidemics, is ordinarily confirmed only in the laboratory although the clinical features of high fever, severe headache, hemorrhagic rash, gangrene and other evidence of thrombosis and marked cerebral symptoms serve to suggest a preliminary diagnosis. Epidemic typhus must be differentiated ordinarily from typhoid fever, murine (flea-borne) typhus, malaria, and relapsing fever. Blood culture, smear, and darkfield examination of the blood serve to differentiate typhoid from typhus in the first week of disease. A positive Weill-Felix reaction with Proteus OX19 antigen, develops during the second week of typhus. It is difficult to ascertain the value of a single agglutination test, but with a well-standardized antigen, a titer of 1:160 is probably significant. An OX19 agglutination test is of more diagnostic value when there is a rise and subsequent fall in titer. Epidemic typhus is most accurately confirmed and differentiated from murine typhus by a positive complement fixation test with appropriate antigens. Only special laboratories are prepared to receive blood for this diagnostic procedure.

5. Treatment: There is no specific treatment of established value. Neither the sulfonamides nor penicillin has any effect on the course of the disease and these drugs should not be used unless proven secondary bacterial infections, known to respond to these chemotherapeutic drugs, develop during the course of illness. Convalescent serum is of no value.

a. The most important aspect of treatment is that of good nursing care. Complete bed rest, avoidance of over-exertion frequent small feedings of food (by the nurse, during the severe part of the course of the disease), adequate fluid intake, and alcohol sponges for high fever should be stressed.

b. Any unnecessary evacuation of the patient to the rear should be avoided in the febrile stage; the principle should be that of bringing nursing care to the patient.

c. Symptomatic drug therapy should not be overdone but aspirin, barbiturates, codeine, and on rare occasions even morphine may be needed for the severe headache and delirium.

d. Digitalis is not indicated in acute myocarditis and its use should be avoided unless there is convincing evidence of congestive heart failure.

e. Adequate fluid intake must be assured by parenteral means if the patient will not cooperate in taking fluids orally. Hypodermoclysis is to be preferred; but, if an intravenous route is necessary, the fluid, consisting of parenteral saline, should be given in small increments. Glucose may be added to the saline.

f. Intravenous plasma should be limited to those cases presenting unmistakable evidence of peripheral circulatory failure.

g. In convalescence, a diet of 3,000-4,000 calories with liberal protein intake should be provided. It is desirable to supplement this with polyvitamine tablets. When fully convalescent, the patient should be evacuated to the United States.

II. PREVENTION AND CONTROL OF EPIDEMIC TYPHUS:

1. Preventive Measures to be Instituted in Advance of Known Typhus.

a. Immunization of Troops. Immunization against typhus of all troops going into Japan and Korea is required by Section II, GHQ, AFPAC, Circular No. 78, dated 26 September 1945. The initial vaccination consists of two inoculations of 1.0 cc. each of typhus vaccine a week apart. Re-immunization with a stimulating dose of 1.0 cc. of typhus vaccine about 1 November and 1 February is required for all troops in occupied areas.

b. Prevention of Lousiness Among Troops. Insecticide, powder, louse, 2 oz. can, (QM No. 51-I-173) should be provided each man. In addition to the frequent inspection of men and quarters for the presence of lice the individual use of one-half the contents of this can should be directed in the dusting of clothes as described in paragraph 3 of Appendix A.

c. Training. A training program in the field control of typhus for medical personnel of case finding teams and of disinfection teams should be instituted.

(1) Case finding teams. Case finding teams, composed of a minimum of one medical corps officer and two enlisted men including an NCO, should be trained in the clinical and bedside diagnosis of typhus and in disinfection procedure for lice so that early detection of civilian cases may be possible and control measures be started promptly. These teams should be supplied with adequate transportation and appropriate supplies and equipment for diagnosis and delousing.

(2) Disinfection teams. These teams, consisting of 3 to 5 men, including an NCO, should be trained in procedures of mass delousing as outlined in Appendix A. They may be formed from Malaria and Insect Control Groups provided for in paragraph 4b (2), Circular No. 42, GHQ, AFPAC, 14 August 1945.

d. Maintenance of adequate supplies. Timely requisition of supplies is essential to control of typhus fever.

(1) Duster, powder, insecticide, QM Stock No. 41-D-755, unit each. Requisition this hand duster in ratio of 1 duster per 100 lbs. of louse powder. The 3 ft. nozzle that is regularly supplied with these dusters should be sawed off to a length of 8 inches. Duster, insect plunger type, QM Stock No. 41-D-3750 may be used as a substitute for the above item.

(2) Outfit, delousing, gasoline engine driven, QM Stock No. 66-O-800, unit each. This power duster outfit furnishes compressed air for 10 special dust

guns included with the unit. An operating team of 11 men (10 dusters and 1 mechanic) can dust a total of 600 individuals and their unremoved clothing per hour. Additional personnel are needed to route persons through the dusting procedure.

- (3) Insecticide, powder, louse, QM Stock No. 51-I-180, unit pound. About 100 lbs. will be required to de-louse 1,000 men. Additional powder is needed for extra clothing and bedding. This powder is a 10 per cent mixture of DDT in pyrophyllite, an inert powder diluent.
- (4) Insecticide, powder, louse, 2 oz. can. QM Stock No. 51-I-173, unit can. This item is identical with the bulk powder as described above but is packed in a 2 oz. shaker can for individual use. Sufficient units should be requisitioned to issue 1 can per man per month.
- (5) Larvicide, DDT, powder, dusting, QM Stock No. 51-L-122, may be used as a substitute for Insecticide, powder, louse, if the latter item is not available. Larvicide, DDT, powder, dissolving, QM Stock No. 51-L-120 must not be used since this item is pure DDT.

e. Reporting of typhus. Close liaison should be maintained by the unit surgeon with local military government and civilian public health agencies to insure adequate and early reporting of typhus cases in the civilian population of his vicinity.

f. Processing of persons from epidemic typhus areas. Military personnel and civilians repatriated from areas in which typhus is endemic must be certified free of lice and without clinical symptoms suggestive of typhus fever.

2. Control Measures When Typhus First Appears in an Area.

a. Immunization.

- (1) Military. Immediate check of immunization registers of all military personnel must be instituted for compliance with the provisions of Section II, Circular No. 78, GHQ, APPAC, dated 26 September 1945, pertaining to a stimulating dose. Particular attention will be given to all typhus control and hospital personnel who must be given a stimulating dose of typhus vaccine, if more than 3 months has elapsed since the primary series or the last subsequent stimulating injection.

- (2) All civilian personnel engaged in any phase of typhus control or hospital duties should be immunized or given the indicated stimulating injection in accordance with the provisions of the Circular noted above.

b. Isolation of Cases.

- (1) Military. Patients with typhus fever should be isolated under accepted conditions of isolation technic and if the number of patients warrants, special isolation wards are desirable. A patient will not be admitted to an isolation ward until he has been bathed, has received an issue of clean bed clothes, and has been deloused with insecticide powder. All discarded clothing must be disinfested by steam or soaking in cresol solution as described in Appendix A. Continuous freedom from lice of the patient, his clothing and bedding must be assured by the daily use of insecticide powder.
- (2) Civilian. It is the responsibility of the unit or area surgeon to maintain liaison with local military government units and civilian public health agencies to assure that civilian cases of typhus are isolated in accordance with the principles as set forth above.

c. Specific program. The unit or area surgeon is responsible for the coordination of typhus control measures of the case finding teams, the disinfestation teams, and such military government and civilian public health units as may be concerned with the control of typhus in civilians. These measures include case finding focal or contact delousing, immunization, and appropriate quarantine measures to prevent the spread of typhus, whether among troops or civilians. He also is responsible for the timely submission of adequate requisitions to assure the constant flow of supplies and equipment as may be required.

3. Control Measures During an Epidemic.

a. The control measures here described should be modified in accordance with the needs of the local situation. These principles are applicable whether typhus occurs in a military unit, a prisoner of war or displaced persons camp, or a village or city.

b. The attack on foci of typhus fever should be directed toward two general methods - the control and eradication of lice and development of passive immunity by immunizing with typhus vaccine. The proportionate use of either or both of these methods requires judgment and adaptation of the broad principles outlined below to suit the problem at hand. In general, delousing with insecticide powder is a simple procedure while immunization is not only time consuming, but is sometimes not well received by civilian

populations. On the other hand, the chief asset of immunization is its "holding" power months after an epidemic has been checked. Inoculation with typhus vaccine should therefore be practiced to the fullest extent possible under existing local conditions. In the military populations, it is a necessity.

c. General principles.

- (1) When one or more cases of typhus fever occur in a small civilian community of less than 500 population, delouse every individual and when feasible, vaccinate everyone.
- (2) When one or more cases of typhus is present in towns of more than 500 population, but are localized in one town or one area, the following procedures are recommended:
 - (a) Delouse all patients and their known contacts with DDT powder.
 - (b) Vaccinate all known contacts of the patients.
 - (c) Apply "focal delousing" which is delousing of all persons living in houses adjacent to those in which the typhus patients live.
- (3) If the typhus admission rate is steadily increasing after two weeks, in spite of the measures initiated above, mass delousing of the population of the whole area should be initiated if feasible, together with such mass immunization as is practicable.
- (4) On the occurrence of one or more cases of typhus in camps of displaced persons, refugees or prisoners of war, immunization with typhus vaccine should be practiced to the fullest extent and mass delousing of all inmates and bedding immediately instituted.
- (5) Quarantine of prison camps, and installations for displaced persons where typhus has occurred should be established for 15 days after effective delousing of the entire group. Civilian communities with typhus should be put off limits to troops.
- (6) Stringent regulations should be issued preventing unnecessary civilian travel into or out of areas until typhus has been controlled and the daily incidence is well on the way down. Where it may be necessary to permit essential civilian travel, all such persons must be deloused and inoculated with at least one dose of vaccine.

d. Operation of Case Finding Teams.

- (1) Interview all doctors and officials (mayor, police chief, high school principal or teachers, priests, etc.) of infected areas to learn of any possible typhus which is occurring.
- (2) Visit each hospital making similar inquiries.
- (3) Examine and obtain full history of any suspicious case, ill or convalescent. Obtain blood by venepuncture to confirm diagnostic impressions by a Weil-Felix examination of the patient's serum. Check with bedside macroscopic Weil-Felix whenever possible.
- (4) Whenever positive diagnosis is made the following procedures should be carried out:
 - (a) The patient, attendant, and all household members are to be immediately deloused with DDT powder administered by hand dusters. All but the patient will be given an initial 1 cc dose of typhus vaccine.
 - (b) A full history is obtained to determine possible sources of infection (the infected louse bite occurred approximately 12 days before onset of fever).
 - (c) Arrangements are made for care of the patient in an isolation hospital.
- (5) All suggestive leads from the patient's story must be followed up - possible sources: neighboring villages, jails, concentration camp, barracks, air raid shelter, hospital, etc., further cases sought for in these places, and delousing and immunizing done when deemed necessary.
- (6) Each medical officer will prepare a written summary of each day's activities for report to the unit surgeon; these reports to be compiled in a weekly report to the area surgeon.
- (7) All new cases should be reported daily to the unit and area surgeon.

e. Operation of Insect Control Groups.

- (1) Aid and supplement the activities of Case Finding Teams in newly uncovered foci of infection.
- (2) Upon receipt of information from the Case Finding Team through the unit surgeon of a newly discovered case of typhus, to carry out the immediate delousing of all contacts and persons within the vicinity of the case(contact and focal delousing).

- (3) Organize mass delousing when directed by the area surgeon.
- (4) Establish control ports in quarantined countries.
- (5) Function in operations of cordon sanitaires.
- (6) Assist and organize delousing operations in camps of displaced persons and prisoners of war.

/s/ Guy B. Denit
/t/ GUY B. DENIT
Brigadier General, U.S. Army
Chief Surgeon

1 Incl: Appendix A
"Individual and Mass Delousing"

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